Case Inst. Tech.

UNCLASSIFIED PRELIMINARY DATA

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Title: "Spectroscopy of Trapped Free Radicals from Low Temperature Hydrogen Atom Reactions"

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Experiments designed to study the possible reaction between hydrogen atoms and carbon dioxide were performed by imbedding various hydrogen halides in solid CO_2 at 77°K and 4°K and irradiating the solid using various ultraviolet light sources. The infrared absorption spectrum of the solid mixture was recorded before and after irradiation, and new absorption features were found after irradiation, indicating that some new molecular species was produced. The identification and determination of the structure of this molecule has occupied much of our research time this past few months, and work on the problem is still being actively pursued, largely by means of isotopic substitution. These studies are, for the most part, being carried out at 77°K, and thus do not require the use of liquid helium as a cooling agent.

Considerable attention has been devoted to the construction and improvement of electrodeless discharge lamps emitting vacuum ultraviolet radiation. Our lamps are energized by radiofrequency radiation. Hydrogen, xenon, and krypton gases are used in these lamps. Average lamp life is now about two hours, and we are working to improve this by the use of a "getter" in the lamp, and by the use of different materials to seal on the LiF window.

A photodiode tube has been constructed which, when used in conjunction with a high sensitivity electrometer, is capable of measuring the ultraviolet output of our lamps.

The chemistry department has recently acquired a Beckman IR-11 Infrared Spectrophotometer, which will enable us to record spectra down to 33 cm^{-1}. We have already made some use of this instrument in connection with our research.

Some exploratory experiments designed to produce the CF_3 radical were performed. These involved the attempted photolysis of $(CF_3)_2CO$ and CF_3COCH in a solid matrix of Argon at 4°K. These experiments will be continued.

At the present time only one graduate student is working full-time on this research (Mr. Norman Moll, an N.D.E.A. Fellow). A second graduate student is working on a part-time basis this semester, and one undergraduate student is performing technical services for us, especially in connection with the RF discharge lamps.

Our research would profit greatly from additional personnel. Therefore, we are attempting to locate a capable post-doctoral fellow who would be interested in associating himself with our research group. If we are successful we shall probably request permission from the N.A.S.A. to support this post-doctoral fellow for one year from funds budgeted for graduate assistants.

Respectfully submitted,

Warren E. Thompson

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